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ARTICLES OF ENDODONTIC INTEREST FROM OTHER JOURNALS

Col. Schindler, Chairman Of Endodontics
59th MDW Dental Directorate
Lackland AFB, TX

Articles:

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ARTICLES OF ENDODONTIC INTEREST FROM OTHER JOURNALS (Cont.)

Col. Schindler, Chairman Of Endodontics
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Articles:

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Types and incidence of human periapical lesions obtained with extracted teeth

Nair PNR, Pajarola G, Schroeder HE. Types and incidence of human periapical lesions obtained with extracted teeth. Oral Surg 1996;81:93-102.

PURPOSE: To (1) determine the frequency of incidence of abscess, granuloma, and radicular cysts among human periapical lesions obtained with extracted teeth; and (2) determine whether periapical cysts occur in morphologically distinct categories, when examined histologically.

M&M: 256 human periapical lesions, obtained together with the extracted teeth were studied. All teeth were diagnosed with apical periodontitis and nonvital pulps preoperatively. Most were removed due to caries or nonrestorable coronal damage. Immediately after extraction, the teeth and attached lesions were fixed, decalcified, axially divided, embedded, and stained. Histologic categorizations of lesions were based on the distribution of inflammatory cells and presence or absence of epithelial cells as follows: (1) ***periapical abscess (PA)*** - a focus of acute inflammation with a distinct collection of PMN's within an already existing chronic granuloma; (2) ***periapical granuloma (PG)*** - chronic inflammation that consists of a granulomatous tissue that is predominantly lymphocytes, plasma cells, and macrophages; (3) ***periapical true cyst*** - an apical inflammatory lesion with a distinct pathologic cavity completely enclosed in an epithelial lining so that no communication to the root canal exists; and (4) ***periapical pocket cyst*** - an apical inflammatory lesion that contains a sac-like, epithelium-lined cavity that is open to and continuous with the root canal. PA's and PG's were further subdivided into epithelialized and nonepithelialized varieties.

RESULTS: Of the total material, 35% were periapical abscesses, 50% were periapical granulomas, and 15% were periapical cysts (9% apical true- and 6% pocket cysts). Thus, of the cystic lesions, 61% were classified as "true", and 39% revealed features of the pocket type. Without regard for the diagnosis, 52% of the lesions were epithelialized, and 48% were not.

C&C: An advantage of studying anatomically intact specimens using step-serial histological sectioning, is having a more accurate picture of a lesion's true identity. Previous observations have concluded a significantly higher percentage of radicular cysts, perhaps due to an interpretation of epithelial portions of granulomas and abscesses as belonging to the cyst category. ***This study showed a low incidence of cysts (15%).*** On the other hand, by only examining those lesions that remain attached to the roots of extracted teeth, we are ignoring the classification of larger lesions (which would stay in alveolar bone). Certainly, Nair et al. support the concept of Simon (1980), in the existence of two distinct classes of radicular cysts.
The authors believe that the pocket cyst may heal after root canal therapy, whereas the true cysts will be self-sustaining and less likely resolved by root canal therapy.

February 1996 **Christopher F. Bates**

Dental pulp response to traumatic injuries - a retrospective analysis with case reports

Feiglin B. Dental pulp response to traumatic injuries - a retrospective analysis with case reports. Endod Dent Traumatol 1996;12:1-8.

PURPOSE: To study retrospectively the fate of pulps following trauma.

M&M: Accidental traumatic injuries occurring since 1974 were assessed at various times using thermal and electrical pulp testing as well as radiographic analysis. If the teeth required RCT, the pulp tissue was fixed and prepared for histologic study.

RESULTS: The data collected in this study revealed that trauma type determined prognosis. Extensive crown fractures with subluxation, extrusive luxation, intrusive luxation, or lateral luxation injuries usually resulted in pulp necrosis in a matter of days up to a month or two, and thus had a poor pulpal prognosis. Of the 79 teeth seen in this category for a minimum of 5 yrs, all required RCT. Subluxation, concussion, and lateral luxation injuries could result in pulp survival for 18-24 months or longer, and these had a moderate pulpal prognosis; of the 48 teeth in this category, 27 required RCT. A third category were those teeth which underwent very slow calcification of the canals; these teeth had a good pulpal prognosis, with only 2/52 requiring RCT over a five yr period. Six case reports illustrating these categories are included.

DISCUSSION: The development of pulpal necrosis is related to the initial pulpal vascular supply injury, which is reflected by the degree of luxation injury, and to the stage of root development. Concussion and subluxation injuries represent minimal damage to pulpal vasculature, while lateral, extrusive, and intrusive luxation injuries result in major damage. The root development stage determines the ability of severed vessels to re-anastomose into the canal. Teeth with open apices have the potential to fare much better than teeth with closed apices. The histopathology of the pulp tissues taken from the cases in this study confirmed that the microscopic picture usually bears no relationship to the patient's symptoms. Four main points resulted from this study: (1) continuous monitoring of traumatized teeth by pulp testing and radiography is essential; (2) teeth should be monitored for a minimum of 5 yrs and preferably longer; (3) adverse changes should be treated as soon as they occur; and (4) the histologic pulpal picture usually does not correlate with presence or absence of clinical symptoms.

February 1996 **Michael Hall**

Orofacial phantom pain: theory and phenomenology

Marbach JJ. Orofacial phantom pain: theory and phenomenology. J Am Dent Assoc 1996;127:221-9.

PURPOSE: To discuss 3 neuropathologic facial pain disorders: (1) phantom tooth pain (PTP); (2) intraoral stump pain (ISP); and (3) phantom bite syndrome (PBS).

DISCUSSION: The author refers to Melzack's *theory of the neuromatrix* in order to try to explain phantom phenomena: (1) bodily sensations perceived in the brain are maintained by information derived from our bodies; this applies also to the vivid phantom sensations; (2) all sensations felt from our bodies can be felt without body input, including pain; sensory experiences are inherent to the neural "hardware" of the brain; (3) the CNS generates sense of self, not the peripheral nervous system; (4) the CNS processes that regulate body recognition are genetically determined and modified by experience. With a clear knowledge of the neuromatrix theory (ho,ho), we can thus easily understand the phantom pain disorders. Phantom pain seems to be preceded by physical trauma, infection, or surgery which anatomically and physiologically alter tissue. Injured tissue may exhibit **allodynia** (painful response to normally nonpainful stimulus), hyperalgesia, spontaneous pain, or pain lacking a known stimulus. Pain as a result of peripheral tissue injury may also be due to nociceptor sensitization, neuroma formation, or altered CNS processing. **PTP.** This is the most common form of orofacial phantom pain. It usually follows surgical procedures such as tooth extraction, root-end resection, or pulp extirpation, and is characterized by *persistent toothache* without refractory periods. All efforts to alleviate pain through repeated endo or surgical procedures are usually fruitless. There appears to be lowered pain threshold (allodynia). Radiographic and lab tests are negative. Sleep is undisturbed, with a symptom-free period often reported on awakening. PTP usually results from damage to a peripheral nerve, most likely if pain was present before nerve injury occurred due to trauma, routine dental care, or surgery. Pain may last long after healing of injured tissues, and may spread. PTP has not been reported in children. **ISP.** Denture pain may be the intraoral equivalent of limb stump pain (ie following amputation). ISP does not disappear with time or with repeated prosthesis adjustment or replacement. Light touch or pressure under dentures may result in intense pain. **PBS.** This syndrome, once considered a psychiatric disorder, is usually associated with the construction of extensive dental prostheses or orthodontic treatment. PBS is characterized by continuous discomfort and lack of familiarity with one's own bite. Nonocclusal orofacial phantom sensations can also be present, such as the perception that teeth or soft tissue feel enlarged or malaligned. The phantom pain disorders must be differentiated from other neuralgias such as trigeminal neuralgia, which is characterized by paroxysmal pain confined to the distribution of the trigeminal nerve, rather than the continuous, dull pain of PTP. Other neuralgias include herpes zoster, post herpetic neuralgia, geniculate neuralgia, and acute pulpalgia. Many patients who are otherwise diagnosed with **atypical facial pain** may in fact be suffering from PTP. PTP is a rare phenomenon, probably with a combined peripheral-central nervous system etiology. The neuromatrix theory suggests that phantom pain syndromes are not psychodynamically based. According to the theory, every tooth cusp and groove in an individual's occlusion resides as a neural signature in the brain; for some few individuals, occlusal alterations result in neural input that is not recognized as the individual's own bite, engaging the person in a lifelong search for the "correct" bite. Pain can be produced in the orofacial region in the same manner that the brain produces neural signals for pain or movement in amputated limbs. Treatment focuses on oral meds which influence afferent impulses and nerve block injections; topical drugs have also shown promise. Phantom pain syndromes can be accompanied by a high measure of demoralization, and account for considerable litigation. Socially, the patients may feel abandoned, stigmatized, or estranged from health care providers, friends, and relatives.

C&C: The phantom pain phenomena are becoming more understood as evidence mounts that there is a neurological basis to explain them. The neuromatrix theory supposedly offers clues; if you can understand the theory, you need to found a pain clinic and rake in the big bucks.

February 1996 **Michael Hall**

Plasma catecholamine and haemodynamic responses to surgical endodontic anaesthetic protocols

Gutmann JL, Frazier LW, Baron B. Plasma catecholamine and haemodynamic responses to surgical endodontic anaesthetic protocols. Int Endo J 1996;29:37-42.

PURPOSE: To assess the effects of clinically relevant anesthetic-vasoconstrictor combinations on plasma adrenaline concentrations and hemodynamic responses.

M&M: 5 mongrel dogs were surgically anesthetized, and cannulated in each femoral artery for measurement of central blood pressure (BP), and for obtaining blood samples. Venous blood samples were drawn prior to any injections, and at 3 and 10 min after injections of experimental solutions. 5 injection protocols were followed, with injections given in the maxillary arch. Protocols: A - 2% mepivicaine without vasoconstrictor (1.8 ml, infiltrated over 30, 60, and 90 sec); B - 2% lignocaine with adrenaline 1:100,000 (1.8 ml × 3, same rates); C - 2% lignocaine with adrenaline 1:50,000 (1.8 ml × 3, same rates); D - a combination of 1.8 ml 2% lignocaine with adrenaline 1:100,000, followed by 1.8 ml 2% lignocaine with adrenaline 1:50,000 (30, 60, and 90 s); and E - direct intravascular injection of 1.8 ml of each anesthetic solution over a 120 sec period. BP's and ECG readings were measured throughout each protocol, and for 3 additional min. Venous blood was analyzed for adrenaline and noradrenaline concentrations.

RESULTS: Anesthetic vehicle alone (protocol A) and all anesthetic/vasoconstrictor combinations (protocols B, C, and D) produced no significant changes in mean BP following maxillary infiltration. Direct infusion of lignocaine with 1:100,000 and 1:50,000 adrenaline produced significant increases in BP in 2/5 dogs. Catecholamine levels did not vary significantly at the 3-min time period, except with the direct vascular infusion, when adrenaline concentrations increased dramatically. Adrenaline concentration ranges were more erratic at 10 min. No abnormal arrhythmias were seen in any animal during the study.

C&C: While we strive to use the least effective amount of any drug, consideration must be given to the twofold goal of anesthesia and hemostasis required for successful endodontic surgery. Techniques and materials used in surgical endodontics require very high levels of hemostasis. The findings of this study support careful use of higher levels of vasoconstrictor (1:50,000 epinephrine) when patient profiles and surgical needs dictate.

March 1996 **Christopher F. Bates**

The reliability of the electric pulp test after concussion injury

Pileggi R, Dumsha TC, Mylinksi NR. The reliability of the electric pulp test after concussion injury. Endod Dent Traumatol 1996;12:16-19.

PURPOSE: To establish the time frame during which the EPT response returns after concussion injury; and, to determine if a correlation exists between the time period and pulpal vascular changes that may occur after the injury.

M&M: 9 ferrets with mature teeth were anesthetized, and positioned in a body holder. A constant force (500 mg rolling sphere), standardized concussion injury was delivered to each maxillary and mandibular right canine. Contralateral canines served as controls. Each animal was subjected to daily EPT stimulation and digastric muscle reflex analysis, using EMG. The animals were killed at 24, 48, and 72 h, and 6, 12, and 28 d post-trauma. Block tooth sections were histologically evaluated for the number of blood vessels.

RESULTS: No animal demonstrated EMG activity due to EPT stimulation before 10 d post-trauma. In all experimental teeth, a positive response occurred between 10 and 14 d. Both the size and number of vessels were significantly increased in all experimental teeth, when compared to controls. The number of vessels appeared to increase to their maximal level at 72 h post-trauma. There were no inflammatory cells in the pulps of control or experimental teeth.

C&C: It was shown by Andreasen et al. (1987) that only 5% of the concussion cases result in pulpal canal obliteration and 3% result in pulpal necrosis. Determining an accurate pulpal diagnosis by vitality tests can be difficult when treating a patient with a traumatized tooth. At least in the anesthetized ferret model, the EPT response returned to baseline in concussed teeth within 10 d. The injuries also resulted in a significant increase in pulpal vessel size and number. These vascular changes may be indicative of a hyperemic state. This might be related to a transient decompression of the pulpal nerve fibers, and the transition from a negative to a positive EPT response after 10 d.

April 1996 **Christopher F. Bates**

Identifying Acute Pulpalgia as a Factor in TMD Pain

Wright EF, Gullickson DC. Identifying Acute Pulpalgia as a Factor in TMD Pain. JADA 1996;127:773-80.

Purpose: This article focuses on identifying an acute pulpalgia as a source of or a contributor to TMD pain.

M&M: 362 patients were seen at a TMD clinic, 11 of which reported acute pulpalgia as contributing to their symptoms via a questionnaire. If the clinician suspected acute pulpalgia, he used percussion & thermal tests to identify the tooth. If the thermal test aggravated the patient's pain, a PDL injection was administered. If this injection reduced or eliminated the pain, the pulp of that tooth was considered to be a factor in the patient's complaint, and the patient was referred for extraction or endodontic treatment of that tooth.

Results: Five of ten pts returning to the TMD clinic for evaluation were symptom-free, and 5 reported continued TMD symptoms.

C&C: Proper diagnosis is ever the key to proper treatment. Confirmation of the offending tooth using a PDL injection may be subject to question, as it is essentially an intraosseous injection, with little assurance that it is affecting only the intended tooth.

June 1996 **Robin E. Hinrichs**

The New CDC Surgical Water Recommendations: Why They Should Be Implemented and What They Require

Waggoner MB. The New CDC Surgical Water Recommendations: Why They Should Be Implemented and What They Require. Comp Dent Educ 1996;17:612-26.

Purpose: To discuss why the new CDC water regulations should be implemented and how they complement previously issued CDC recommendations.

Summary: The source for most dental waterlines is the municipal water supply, which is typically contaminated with a number of different bacteria & viruses. Dental units have been found to be contaminated by these & others, including *Legionella spp,* HSV, HBV and Rotavirus. Biofilms formed in water lines contain glycocalyx, which acts a physical barrier to disinfection techniques. Amoebas, protozoa and *Legionella spp* have been shown to survive in mature biofilms subjected to accepted biocides for appropriate & extended times. Increased water temperature increases virulence in cultures. To comply with CDC regulations, sterile irrigant must reach the patient in a sterile form in invasive procedures (like surgery). Any device that is used to deliver water must be sterilized between patients. In California, these recommendations are the minimum standard of care, & in many other states, not following them is considered "negligent" from a malpractice reference point.

C&C: The real problem is our dental units. During surgery, a separate & sterile delivery system should be considered a requirement. Attaching sterile water units or lines to these units would not insure contaminant free water reaching the site. For the most part though, healthy patients are not at risk, only those that are immunocompromised or pneumonically compromised. A good article.

June 1996 **Robin E. Hinrichs**

Penicillin as a supplement in resolving the localized acute apical abscess

Fouad AF, Rivera EM, Walton RE. Penicillin as a supplement in resolving the localized acute apical abscess. Oral Surg 1996;81:590-5.

PURPOSE: To examine the effect of penicillin supplementation on the reduction of symptoms and the course of recovery of the LAAA (localized acute apical abscess) after emergency endodontic treatment.

M&M: Patients were selected from adults presenting for emergency treatment having pulp necrosis with periapical pain and/or swelling. They were excluded from the study if they presented with signs or symptoms of spreading infections, or if their medical history precluded the use of antibiotic medications. After appropriate local treatment had been performed, the patients were then randomly assigned to one of three groups using a double blind protocol: penicillin VK group, placebo group, or neither medication group. All patients received ibuprofen 600 mg four times daily for 24 hours. Patients entered their pre- and postoperative pain and swelling experience on a visual analog scale for up to 72 hours.

RESULTS: The scores of 32 patients were evaluated. The overall finding was no clinically significant difference in the three groups as to reduction of symptoms or course of recovery. Most patients experienced total resolution of LAAA in the 3-day evaluation period.

C&C: The study excludes patients with infections, which is the primary reason for using antibiotics. If LAAA is primarily an inflammatory/immunologic phenomenon, then antibiotics would have minimal effectiveness. On the other hand, ibuprofen would be effective and indicated under these conditions, which could account for the results obtained.

June 1996 **Orest Harkacz, Sr.**

Haemostasis in periradicular surgery

Witherspoon DE, Gutmann JL. Haemostasis in periradicular surgery. Int Endo J 1996;29:135-49.

SUMMARY: The paper focuses on the concepts of hemostasis as it pertains to endodontic surgical applications. First and foremost to controlling hemostasis is a thorough knowledge of the medical history of the patient for assessing presurgical conditions which may lead to increased bleeding. Surgical considerations for controlling hemostasis include local anesthesia, flap design, tissue elevation, tissue reflection, and local hemostatic agents. Use of anesthetic with 1:50000 or 1:80000 adrenaline is advocated and is clinically superior in controlling hemostasis than lower catecholamine concentrations, provided it is injected into the submucosa (acting on the α-constrictive receptors) and not the surrounding muscle tissue (which acts on the β-dilatory receptors). With flap management, knowledge of incision design as they pertain to coursing supraperiosteal blood vessels is essential. Minimal contact with saliva, which contains fibrinolytic activity, will further reduce bleeding during surgical procedures. Local hemostatic agents consist of non-collagen-based agents (bone wax, ferric sulfate, Surgicel, Gelfoam, Spongostan, Kaltostat, tissue adhesives such as fibrin glue, antifibrinolytic agents, and topical thrombin [called Thrombogen]) and collagen-based agents (Avitene, Hematex, Collaplug, Hemofibrine, Hemocollagen, Instat, Collacote, Collastat, Hemastogen, Astroplast, Absele and ACP). Certain ferric sulfate materials, if used judiciously and adequately curettaged/irrigated prior to closure, will result in near normal healing post application. Most of the non-collagen materials suffer from foreign-body reactions, impaired bacterial clearance, infections, and delayed healing. Investigations into the use of fibrin sealants as a method of primary closure have been favorable in human and animal studies. These products have a mode of action similar to that of collagen-based products, providing an initial framework for platelet aggregation and adhesion, and subsequently activating the clotting pathways. Antifibrinolytic agents (tranexamic acid and epsilon-aminocaproic acid) prevent the breakdown of existing clots, thus preventing further bleeding. Topical thrombin initiates the extrinsic and intrinsic clotting pathways. It was designed for topical application wherever wounds are oozing blood from small capillaries and venules. This product is not as effective as collagen-based hemostatic agents. Collagen-based hemostatic agents consist principally of collagen in differing microstructures and densities. Allergenicity and unwanted tissue reactions do not occur when animal collagen of a highly purified nature is used. Currently, there are 4 mechanisms by which collagen products are believed to enhance hemostasis: (1) stimulation of platelet adhesion, platelet aggregation and release reaction; (2) activation of Factor XII (Hageman factor) and possibly other factors in the clotting cascade; (3) mechanical tamponade by the structure that forms at the collagen blood wound interface; and (4) the release of serotonin (5-hydroxytryptamine, 5HT). The products available come in the form of non-woven pads, fine powdered forms, or malleable paste-like substances. Tissue response and healing with these products are very good. If allergenicity does occur, it is suspected that lack of purity is the cause for biocompatibilty problems. Experimental agents which have been researched in the past or currently include cyanoacrylate, Adaptic(a rayon and cellulose acetate immersed in a hydrophilic petroleum), Alzamer (a bone wax-like bioerodible polyorthoester), and Chitosan (a carbohydrate biopolymer derived from shellfish exoskeletons). Of these, only Chitosan has not displayed a foreign body reaction with delayed wound healing. Hemostasis can also be managed through a thermal approach in the form of cold compresses, hot oils and cautery. These effects on hemorrhage are at best very transient and superficial, and may in some instances impair healing.

C&C: The most significant determinant of managing hemostasis in periradicular surgery is the surgeon. Skill, technique and attention to detail during the procedure will limit the potential for possible hemorrhage problems.

June 1996 **Orest M. Harkacz, Sr.**

Four Common Mandibular Nerve Anomalies That Lead To Local Anesthesia Failures

Desantis JL, Liebow C. Four Common Mandibular Nerve Anomalies That Lead To Local Anesthesia Failures. JADA 1996;127:1081-6.

Purpose: To discuss four common anomalies of mandibular tooth innervation, possible reasons for local anesthesia failure, and ways to overcome these problems.

Summary: The article contains a quick review of the anatomy of the mandible, and some possible anomalies that may contribute to anesthesia failure. An accessory mylohyoid nerve may carry sensory output from some mandibular teeth. If this is suspected, a Gow-Gates block is suggested. A bifid mandibular nerve and accessory foramen have been noted with a frequency of 0.9%. A panorex usually detects this anomaly, & a Gow-Gates is again recommended. A retromolar foramen, with innervation thought to arise from the long buccal or early accessory branches of the inferior alveolar nerve has been reported at 7.7% frequency. Gow-Gates or other high blocks are recommended. Contralateral innervation of anterior teeth may be due to extensive overlapping across the midline by the incisive nerve. Anesthetic options here include contralateral incisive nerve or mental nerve blocks.

C&C: In endodontics, a good supplement is the PDL injection for quick anesthesia until we can complete the total pulpectomy. A useful, easy to read article.

July 1996 **Robin E. Hinrichs**

Transantral endodontic surgery

Wallace JA, Transantral endodontic surgery. Oral Surg 1996;82:80-3.

Purpose: To discuss the advantages and aspects of using a transantral approach during endodontic surgery.
Summary: Palatal roots of max molars are in apical communication with the sinus 20% of the time, and within 0.5 mm from the sinus 40% of the time. Mucous membranes of the sinus, complete with cilia, will regenerate in about 5 months after its total surgical removal. Two cases were presented involving apical surgery on palatal roots of maxillary molars. Access was gained either with a high-speed fissure bur, or with a Stryker bur. Prescriptions of amoxicillin (10 days), and antihistamine/decongestant (3 days) were given. One year recalls showed normal healing and lack of symptoms. The discussion concludes with a review of the anatomy of the area. A buccal approach involves the superior alveolar nerves, anterior palatine nerve, and the infraorbital nerve and will induce paresthesia. A buccal approach does not generally produce bleeding problems.

C&C: Although a possible sequalae is an oral-antral communication, or chronic sinusitis. The author quoted a study of non-infectious sinus closures that had only 1% fistula development. This approach would give us increased access in the area of maxillary second molars, with very little increased risk.

July 1996 **Robin E. Hinrichs**

Repair of furcal perforations with mineral trioxide aggregate. Two case reports

Arens DE, Torabinejad M. Repair of furcal perforations with mineral trioxide aggregate. Two case reports. Oral Surg 1996;82:84-8.

Purpose: To substantiate that MTA is a suitable material for furcation perforation repair.
Summary: Two cases with large furcal perforations, one measuring 4x5 mm, and one 7x10 mm were presented. In both cases, the perforation was cleaned with a round bur, the site was irrigated with 2.5% NaOCl several times, then dried with cotton pellets. MTA & sterile water were mixed to a putty consistency, & placed in the defects packing with a moist cotton pellet. MTA was extruded both times into the defects, in quite significant amounts. One year post-op radiographs showed significant resolution of the lesions.

C&C: The material extruded in the furcal areas seemed to be well tolerated by the body. A promising technique. Next, I guess the material will be promoted as bone graft material.

July 1996 **Robin E. Hinrichs**

The use of non-ISO-tapered instruments for canal flaring

Weine FS. The use of non-ISO-tapered instruments for canal flaring. Comp Cont Educ Dent 1996;17:651-63.

SUMMARY: Before 1958, endodontic instruments had no standardized shape or pattern between successively larger sizes. In 1958, Ingle established a nomenclature for the parts of the instruments and a standardization for the length of flutes, taper, and the relationship between successive sizes. His recommendations were endorsed and supervised by the International Standards Organization (ISO). The original designations of D_1 and D_2 were reviewed and how they have been revised to the new designations of D_0 and D_{16}. The taper of the instruments under the current standard follow a 0.02 mm increase in width for each 1 mm of length. Gates-Glidden and Peeso reamers do not follow the standard. Recently several instruments have been introduced with greater than ISO-standard taper in order to produce preparations with increased taper from the tip to the orifice. These modifications should produce better and cleaner preparations leading to easier-to-place canal-filling materials. The two systems described are the Profile .04 Taper Series 29 rotary instruments and the McXim Files, whose taper varies from .03 to .055 mm. Both systems are utilized in a rotary manner using a gear-reduction handpiece so that revolutions are maintained at no greater than 350 rpm. Weine then goes on to describe his method for using these newer file systems and his changes from the manufacturers' instructions for safer use. Basically, he utilizes the rotary instruments for preflaring the coronal portion, then proceeds with hand instrumentation to prepare the apical portion. He lists the following safety precautions when using the increased tapers: (1) do not use increased tapered instruments past the elbow in curved canals; (2) do not drill into the canal; (3) always insure patency to the full working length after suing files short of the working length; (4) the instructions that come with the products may be incomplete or incorrect; (5) practice, practice, practice; (6) use these products only in gear-reduction handpieces.

C&C: Weine's approach is to use the best of both worlds (hand and mechanical instrumentation) to achieve a desired result. The views in this paper are his own and vary from the manufacturers' views, which state that the entire canal (to working length) can be prepared entirely with their machine driven files, without the need for hand instrumentation apically.

July 1996 **Orest M. Harkacz, Sr.**

Examination of external apical root resorption with scanning electron microscopy

Malueg LA, Wilcox LR, Johnson W. Examination of external apical root resorption with scanning electron microscopy. Oral Surg 1996;82:89-93.

PURPOSE: To examine by SEM, and to compare the incidence and extent of external apical root resorption in human teeth with different pulpal/periapical diagnoses.

M&M: Patients 18 years or older presenting for routine extraction of one or more permanent teeth were used in the study. Standard pulpal and periapical tests were performed by one examiner using the Vitality Scanner by Analytic Technology, Endo Ice, digital pressure applied to the incisal edge and palpation of the mucosa over the apex. Six diagnostic combinations were included: group 1, necrotic pulp/chronic apical periodontitis; group 2, necrotic pulp/acute apical abscess; group 3, necrotic pulp/normal periapex; group 4, normal pulp/normal periapex; group 5, irreversible pulpitis; normal periapex; group 6, reversible pulpitis/normal periapex. Forty teeth were collected after extraction, sectioned horizontally 6 mm from the anatomic apex and prepared for SEM examination. Photomicrographs were scored by two blinded examiners. Apical resorption was categorized as none, partial, or complete. Presence or absence of a funneling appearance of the resorption was also recorded.

RESULTS: Teeth with irreversible pulpitis/normal periapex had the least resorption. Teeth with periapical lesions had significantly more resorption than those without radiographically evident periapical lesions. Teeth with necrotic pulps had more resorption than those with vital pulps.

C&C: Pulp necrosis with radiolucent apical pathosis is more likely to demonstrate resorption than other diagnosed conditions. Clinically, this would lend support to instrumentation and obturation at 1.0 - 2.0 mm levels from the radiographic apex as compared to the 0.5 - 1.0 mm levels normally attempted.

July 1996 **Orest M. Harkacz, Sr.**

Management of dens evaginatus: evaluation of two prophylactic treatment methods

Sim TPC. Management of dens evaginatus: evaluation of two prophylactic treatment methods. Endod Dent Traumatol 1996;12:137-140.

Purpose: To report the results of a study evaluating two prophylactic restorative procedures used to treat dens evaginatus (DE).

M&M: 817 students with 1591 premolars with DE were used. 1098 received removal of the tubercle, and an occlusal amalgam based with calcium hydroxide liner and ZOE cement. 192 had their tubercles trimmed, with the cavity preparation extending only into dentin. A calcium hydroxide liner was placed, the tooth etched, and a composite resin placed to fill the cavity & seal the fissures. The third group was of 301 teeth, used a control. They received no treatment, but was confined to teeth with very small tubercles which did not appear to interfere with occlusion.

Results: 5.37% of the amalgam group developed pulpal signs and symptoms within 24 months. Only 0.52% of the composite group and 3.65% of the control groups developed pulpal symptoms. 2.1% of the children in Singapore had DE.

C&C: This is one of the first published reports actually comparing the treatment options and their results for this anomaly. Although the composite group was much smaller due to the preference of local dentists for amalgam, the numbers are still statistically significant.

June 1996 **Robin E. Hinrichs**

Periradicular curettage

Lin LM, Gaengler P, Langeland K. Periradicular curettage. Int Endo J 1996;29:220-227.

Purpose: To review the pathobiology of inflammatory periradicular lesions, the causes of periradicular inflammation, and to clarify whether periradicular curettage in endodontic surgery is important to clinicians.

Summary: The chronic nature of periradicular lesions is quite similar to granulation tissue. Macrophages, multinucleated giant cells, PMN's, T & B cells, and plasma cells are present. Periradicular inflammation is able to cause resorption by means of locally produced cytokines (IL-1, TNF, and PGE). It is rarely able to cause irreversible neurovascular damage to the adjacent vital tooth. Inflammatory periradicular cysts do not have a tendency to recur if not completely removed. The most important cause of this inflammation of endodontically treated teeth is most likely due to the persistence of bacterial infection in the root canal system. The periradicular healing of teeth treated only with NSRCT indicates that removal of all the granulation tissue is not required for healing. It is important to note the difference between periradicular inflammation and periradicular infection. In the former, bacteria may or may not be present. In the latter, bacteria from the infected root canal have colonized and established an infectious process. Studies have confirmed that most endodontic periradicular lesions are of an inflammatory and not infectious nature.

July 1996 **Robin E. Hinrichs**

Management of intrusive luxation injuries

Oulis C, Vadiakas G, Siskos G. Management of intrusive luxation injuries. Endod Dent Traumatol 1996;12:113-19.

SUMMARY: Traumatic intrusion of permanent teeth is a relatively infrequent but serious dental injury due to the complicated picture it involves. Various treatment approaches have been suggested regarding management of intrusive luxation injuries. Techniques suggested at repositioning the intruded teeth include observation for reeruption, surgical repositioning and orthodontic repositioning. Complications involved with spontaneous eruption include the incidence of pulp necrosis and root resorption in cases where no significant amount of eruption occurs. Andreasen et al. report a 63% incidence of pulp necrosis in a sample of 24 teeth with an open apex, and a 100% incidence in 37 teeth with a closed apex. To overcome this problem, surgical exposure of the intruded tooth has been suggested to gain access to the root canal while waiting for spontaneous eruption. This, however, leads to an esthetic problem from the alveolar osseous defect. Ankylosis has been reported in cases of severe intrusion. Contrary to the conservative approach of observation, Skieler suggests immediate surgical repositioning of the intruded tooth. This treatment has been associated with a high incidence of ankylosis, pulp necrosis, and loss of marginal bone. In order to reduce the complications of intrusive injuries, Andreasen recommends the immediate application of orthodontic forces to the intruded tooth, which renders a more biological way of repositioning the tooth. Access for root canal treatment can be established within the first 2-3 weeks after injury using this approach. Based on the findings of the current literature, management of intrusive injuries should be based upon the severity of the injury. Observation for spontaneous reeruption is suggested in cases with minimal intrusion, while immediate application of orthodontic extrusive forces is suggested in cases of severe intrusion. Two case reports were presented. In the first patient, a moderate degree of intrusion was present and immediate orthodontic traction was undertaken. Orthodontic attachments were bonded to the lower incisors so that rapid extrusion of the tooth (right max lateral incisor) could be accomplished to allow for an early endodontic access. On completion of the extrusion (4 weeks), retention with a 0.016 wire was placed for 3 months. Complications encountered in this case included external root resorption early on, with cervical resorption as well as a periapical radiolucent lesion later post-trauma. In the second case, traumatized incisors sustained a severe degree of intrusion with simultaneous occurrence of an alveolar fracture that resulted in an alveolar bone defect. Immediate application of orthodontic forces was not possible because of the inability to bond the orthodontic attachments. The intruded teeth had to be partially repositioned with forceps before brackets could be placed. Orthodontically correcting the position of the teeth has resulted in improvement of the osseous defect.

C&C: It has been suggested that in cases of avulsion and intrusion luxation of mature teeth, calcium hydroxide should not be used until the PDL repair has been completed. The theory for this is that a potential harmful effect on the PDL might lead to localized ankylosis and replacement resorption. A review of existing clinical investigations studying long term prognosis of intruded teeth treated with calcium hydroxide does not support this theory. Therefore, calcium hydroxide should be placed as an intracanal dressing when feasible.

August 1996 **Orest Harkacz, Sr.**

Prognosis of root-fractured permanent incisors

Çaliskan MK, Pehlivan Y. Prognosis of root-fractured permanent incisors. Endod Dent Traumatol 1996;12:129-36.

PURPOSE: To evaluate the prognosis of root fractured teeth.

M&M: The material included the records and radiographs of 48 patients (30 males, 18 females) with 56 root-fractured permanent incisors who sought treatment at the Ege University School of Dentistry in Izmir, Turkey. The prognosis of the root-fractured incisors was evaluated clinically and radiographically for 2 to 31 years. Information about initial case histories, examination and treatment of root-fractured teeth were recorded retrospectively from patient cards.

RESULTS: The age of the patients at the time of injury ranged from 8 to 40 years. Most of the root fractures occurred in the 16-20 year age group (38%) followed by the 11-15 year age group (29%). Males were involved more often than females. Fifty-two percent of the patients visited the dental clinic within the first week, while 48% did so 1 month-31 years later after the injury. The leading cause of root fractured injuries was falls (46%) and mostly involved one tooth (71%). Maxillary central incisors were the most often affected teeth (95%). The most common type of root fracture was in the middle third of the root (57%) followed by the apical part (34%). About 59% of untreated or splinted teeth maintained their vitality. Healing with connective tissue was observed in 19 teeth, with calcified tissue in 15 teeth, with osseous tissue in one tooth, and with granulation tissue in 21 teeth. Pulp canal obliteration was found in 75% of the root-fractured teeth, with the majority affecting both the apical and coronal fragments in 41%, or the apical fragment alone in 30%. Rarely was pulp canal obliteration seen in the coronal fragment alone (4%). Pulp canal calcification in both the apical and coronal fragments was more frequent in connective tissue union (79%) than in the group with hard tissue union (47%). The formation of pulpal hard tissue produced no additional clinical problems. Partial or total pulp necrosis were noted in 21 (37.5%) teeth. Endodontic treatment was successful in 12 cases. The remaining 9 teeth were extracted due to the loss of marginal alveolar bone and apical periodontitis.

C&C: Pulp calcification was the most common sequelae of root fracture.

August 1996 **Orest Harkacz, Sr.**

Current Trends in Endodontic Treatment: Report of a National Survey

Whitten BH, Gardiner DL, Jeansonne BG, Lemon RR. Current Trends in Endodontic Treatment: Report of a National Survey. JADA 1996;127:1333-41.

Purpose: To obtain information on routine, nonemergency endodontic treatments adapted to clinical practice.

M&M: 1000 general dentists (GD) and 500 endodontists (EN) were sent questionnaires. Results were statistically evaluated.

Results: Highlights of the results include: 59% GD and 92% EN use rubber dams during endo tx. NaOCl was the most popular irrigant for 87% of total respondents (TR). EN choice of intracanal medicaments was none (29%), followed by CaOH(22%). 27% GD used formocreosol and only 9% used CaOH. More GD (19%) indicated use of Thermafil obturators. 10 responders, all GD used formaldehyde-containing sealers, including Sargenti paste. Both groups showed a definite increase in single-appt treatment. 62.5% GD prescribe antibiotics for chronic apical periodontitis with sinus tracts, compared with 29.2% EN. This & other responses indicate an overuse of antibiotics among the GD. Another general trend was an increase in the use of NSAID's alone or with narcotics to manage pain. GD's use codeine more often, and EN's use hydrocodone, oxycodone, propoxyphene or meperidine HCI. There is a general trend to clean & shape to the radiographic apex rather than 1 mm short.

C&C: In 1988, Gatewood et al. conducted a similar study. This study compared it's results to the present ones for a trend analysis.

Sept. 1996 **Robin E. Hinrichs**

Measurement of blood flow with radiolabeled microspheres in reflected mucogingival flaps in cats

Wuchenich GT, Torabinejad M, Gilbert RD, McMillan P. Measurement of blood flow with radiolabeled microspheres in reflected mucogingival flaps in cats. Oral Surg 1996;82:330-4.

Purpose: To quantify and to compare blood flow in maxillary mucogingival flaps that have been injected with 2% plain lidocaine and 2% lidocaine with 1:50,000 epinephrine.

M&M: sixteen cats were divided into 2 groups. Groups 1 (6 cats) had maxillary mucogingival tissues reflected on either the left or right quadrant with the contralateral tissues left attached. Blood flow was measured in both the nonreflected and reflected tissues. Group II (10 cats) was used to test the effects of different solutions on blood flow in reflected tissues. The following solutions were evaluated: 1) saline solution; 2) 2% lidocaine plain; 3) 2% lidocaine with 1:50,000 epinephrine; 4) no injection. Each quadrant was injected in the vestibule of the mucogingival tissue as follows: 0.2 ml apical to the canine, 0.2 ml apical to the first premolar, and 0.2 ml apical to the second premolar for a total of 0.6 ml of solution per quadrant. After injection of the solutions, the mucogingival tissues were reflected a minimum of 90 minutes before the injection of 153 Gadolinium microspheres. After injection of the microspheres into the left ventricle of the heart, the tissues were harvested and placed in a gamma counter.

Results: Group I had a mean flood flow value of 34.4 ml/min/100 gm tissue for the unreflected samples and 152.3 ml/min/100 gm of reflected tissue. The levels of blood flow in tissue samples in group II were: no injection (control), 41.2 ml/min/100gm; saline solution, 46.8 ml/min/100gm; 2% lidocaine with 1:50,000 epinephrine 60.6 ml/min/100gm; and 2% lidocaine plain 90.2 ml/min/100gm. There was a significant difference between the amount of blood flow in tissue samples injected with 2% lidocaine and those injected with saline solution or with no treatment. There was no significant difference between blood flow in samples injected with 2% plain lidocaine and those injected with 2% lidocaine with 1:50,000 epinephrine.

C&C: The results are confusing when comparing Group I to Group II. Mean blood flow values for reflected tissues in group I were 152.3 ml/min/100gm. Mean blood flow values for reflected tissues for the control (no injection) in group II were 41.2 ml/min/100gm. The two values differ significantly, yet they represent the same procedure (tissues reflected with no injection). Within group II, there was significantly more blood flow in those injected with 2% lidocaine without epinephrine compared with those with no treatment or those injected with sterile saline solution. This is expected, since lidocaine is a vasodilator by nature, and would thus increase blood flow. The addition of vasoconstrictor did decrease the blood flow compared to lidocaine alone, but this difference was not statistically significant. However, the amount of blood flow increase with lidocaine administration was still less than the amount of blood flow increase seen with flap reflection alone in group I. In theory, the addition of lidocaine alone to reflected tissues should have had the highest blood flow of any group due to its vasodilatory effects. But, this was not observed.

September 1996 **Orest M. Harkacz Sr.**